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For 3rd Semester B.E. Mechanical Engineering

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Manufacturing Technology - I

by Dr. G.K. Vijayaraghavan and Dr. R. Rajappan

First Edition: May 2018

Price: Rs. 300/-

ISBN:

Published by and copies can be had from:

LAKSHMI PUBLICATIONS

Plot No.73, VGP Gokul Nagar,
2nd Main Road (40 Feet Road),
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Dedicated to

My

Beloved Students

PREFACE

I am pleased to bring out the first edition of **"Manufacturing Technology - I"** book for Engineering and Technology studies. This book is written to serve the needs of undergraduate students embarking introductory course in Manufacturing Technology. This book is based on the latest syllabi prescribed by the ***Anna University Chennai, Trichy, Coimbatore & Tirunelveli*** for ***3rd Semester Mechanical engineering*** students of its affiliated colleges.

This book consists of 5 units.

- **Unit 1** deals with the sand casting, sand mould, type of patterns, pattern materials, pattern allowances, moulding sand properties and testing, types and applications cores, types and applications of moulding machines, various melting furnaces such as blast and cupola furnaces, principle of special casting processes such as shell, investment, ceramic mould, pressure die casting, centrifugal casting, CO_2 process, stir casting and defects in sand castings.
- **Unit 2** describes in detail about Operating principle, basic equipment, merits and applications of various joining processes such as gas welding, manual metal arc welding, gas tungsten arc welding, gas metal arc welding, submerged arc welding, electro slag welding, resistance welding, plasma arc welding, thermit welding, electron beam welding, friction welding and friction stir welding, brazing and soldering. This unit also deals with types, causes and cure of weld defects.
- **Unit 3** has an in-depth dealing of various metal forming processes such as hot working and cold working of metals, open, impression and closed die forging processes with forging operations, rolling of metals, flat strip rolling, shape rolling operations, defects in rolled parts, rod and wire drawing, tube drawing, hot and cold extrusion.
- **Unit 4** elaborately discusses various sheet metal topics such as sheet metal characteristics, shearing, bending and drawing operations, stretch forming operations, formability of sheet metal, test methods, special forming

processes, working principle and applications, hydro forming, rubber pad forming, metal spinning, introduction of explosive forming, magnetic pulse forming, peen forming, superplastic forming and micro forming

- **Unit 5** deals with the manufacturing of plastic components in which various topics such as types and characteristics of plastics, moulding of thermoplastics, working principles and typical applications of injection moulding, plunger and screw machines, compression moulding, transfer moulding, introduction to blow moulding, rotational moulding, film blowing, extrusion, thermoforming and bonding of thermoplastics.

Important solved University questions, and two mark questions and answers have been added at the tail end of each unit which will enable the students to score high marks in the University examinations. Recent *Solved Anna University Question Papers* have been added at the end of this book.

With these features, I sincerely hope that this book would serve as a valuable text for the students.

Though efforts have been taken aiming at a '*zero flaw*' content, I do recognize that mistakes may have inadvertently crept in. I welcome constructive criticisms on any specific topics of this book.

My sincere thanks to **Mrs. Nirmala Durai, Proprietor** of **"Lakshmi Publications"** and **Publishing Advisor Mr. A. DURAI, B.E.** for their involvement to make this publication successful.

- Dr. G.K. VIJAYARAGHAVAN

ANNA UNIVERSITY SYLLABUS - Reg. 2017

ME8352 MANUFACTURING TECHNOLOGY - I

UNIT I METAL CASTING PROCESSES

Sand Casting : Sand Mould – Type of patterns - Pattern Materials – Pattern allowances – Moulding sand Properties and testing – Cores –Types and applications – Moulding machines – Types and applications; Melting furnaces : Blast and Cupola Furnaces; Principle of special casting processes : Shell - investment – Ceramic mould – Pressure die casting - Centrifugal Casting - CO_2 process – Stir casting; Defects in Sand casting.

UNIT II JOINING PROCESSES

Operating principle, basic equipment, merits and applications of: Fusion welding processes : Gas welding - Types – Flame characteristics; Manual metal arc welding – Gas Tungsten arc welding - Gas metal arc welding – Submerged arc welding – Electro slag welding; Operating principle and applications of : Resistance welding - Plasma arc welding – Thermit welding – Electron beam welding – Friction welding and Friction Stir Welding; Brazing and soldering; Weld defects: types, causes and cure.

UNIT III METAL FORMING PROCESSES

Hot working and cold working of metals – Forging processes – Open, impression and closed die forging – forging operations. Rolling of metals– Types of Rolling – Flat strip rolling – shape rolling operations – Defects in rolled parts. Principle of rod and wire drawing – Tube drawing – Principles of Extrusion – Types – Hot and Cold extrusion.

UNIT IV SHEET METAL PROCESSES

Sheet metal characteristics – shearing, bending and drawing operations – Stretch forming operations – Formability of sheet metal – Test methods –special forming processes- Working principle and applications – Hydro forming – Rubber pad forming – Metal spinning– Introduction of Explosive forming, magnetic pulse forming, peen forming, Super plastic forming – Micro forming.

UNIT V MANUFACTURE OF PLASTIC COMPONENTS

Types and characteristics of plastics – Moulding of thermoplastics – working principles and typical applications – injection moulding – Plunger and screw machines – Compression moulding, Transfer Moulding – Typical industrial applications – introduction to blow moulding –Rotational moulding – Film blowing – Extrusion – Thermoforming – Bonding of Thermoplastics.

UNIT 1 METAL CASTING PROCESSES

UNIT 2 JOINING PROCESSES

UNIT 3 METAL FORMING PROCESSES

UNIT 4 SHEET METAL PROCESSES

UNIT 5 MANUFACTURE OF PLASTIC COMPONENTS

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